INTEGRATED RIVER BASIN PLANNING AND MANAGEMENT CONCEPTS & ISSUES

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Introduction

Water is an integral part of the economic and social issues. Population growth, rapid urbanization and industrialization, the expansion of agriculture and tourism, and climate change all put water under increasing stress. Given this growing pressure it is critical that this vital resource is properly managed. The pressure on water resources highlights the hydrological, social, economic and ecological inter-dependencies in river, lake and aquifer basins. These interdependencies demand more integrated approaches to developing and managing water and land resources. Integrated River Basin Planning and Management (IRBPM) is being considered widely as a process, dynamic in nature, for managing this dynamic resource along with other static resources using basin or sub-basin as a manageable unit. The objective of IRBPM system is to mitigate the natural hazards and use the resources for productive and social purposes with due care to the environment to ensure the sustainability of the system.

Since water is a very basic resource, from the consideration of sustenance to surplus, its proper management becomes a priority with the increase in scarcity of this resource. Fresh water availability was not an issue in the past given a meager demand. With increase in demand in different sectors for the developmental and economical activities, the pressure on this resource compelled the water managers to ponder over the hydrologic and social issues of this dynamic resource more rationally. In this context, Dublin conference (1992) is important in the history of the water resources management as for the first time the international community accepted the finiteness of the water availability and economic value of this resource. Further, for the management of the resource participatory approach has been emphasized and women's role for management and safeguarding of water has been recognized in the above Conference. This conference is the booster for the promotion of IRBPM and instrumental for the Rio Agenda 21 and Millennium Development Goal.

Issues of Water Management

(i) Water is essential to human, animal and plant life. On the one hand, water supports productive activities like agriculture, generation of hydropower, industries, fishing, tourism, transport, etc. On the other hand, water can be extremely destructive, carrying diseases and flooding vast areas. Insufficient water or prolonged drought can result in widespread death and economic decline.

(ii) Water can also cause or escalate conflicts between communities in a local or national basin, or in transboundary basins shared by more than one country.

(iii) We also need to understand the ways in which society uses and pollutes water, or modifies the hydromorphology of water courses. These change the quantity and quality of water in ecosystems. In many developing countries there is ongoing degradation of freshwater resources – in terms of both quantity and quality – and of aquatic ecosystems. This means fewer benefits, less life support and more water-related risks and hazards.

(iv) Clearly, factors such as population growth, demographic changes, economic development and climate change have a critical impact on water resources. Equally, water resources have a significant impact on production and economic growth, on health and livelihoods, and on national security.

(v) In many regions, managing water has always been a major problem because of the natural variability and uncertainty in weather patterns. With climate change this problem is likely to get worse. In some basins, changes in climate will mean less rainfall and lower river flows, while in other basins climate change will mean more floods. These changes will be exacerbated because of other variations such as population and economic growth, urbanization and rising demands for food, which increase the demand for water, and degrade water courses and aquifers in basins where water is already scarce.

Challenges in Water Management

(i) Economic growth demands for water infrastructure to support food production, generate energy, and provide goods and services. Such developments have a big impact on water resources. For many years, it was assumed that there was enough water for these developments and those natural processes would deal with pollution. But, these developments have also brought enormous changes to the hydrological regimes, ecosystems and landscapes of most of the world's rivers, lakes and aquifers. The basin manager now faces huge pressures, risks and conflicts in balancing economic development with maintaining healthy water resources. But, in order to progress, poorer regions of the world must develop water infrastructure. The challenge for governments and basin managers is to balance development with sustainability. This means finding smarter ways to develop and manage water resources and finding responses appropriate to the circumstances in each particular basin.

(ii) As towns and cities spread along riverbanks and lakeshores, water pollution from domestic and industrial waste increases. Advances in agriculture mean that farmers use more fertilisers and pesticides, which also increase pollution. The consequences of biological and chemical pollution, and the alteration of river and lake flows and diminution of groundwater tables, can be dire. Rivers become over-rich in nutrients and aquatic weeds proliferate. Biodiversity is lost and fisheries decline. Plus, more and more people are becoming exposed to water-related health hazards. Even the most conservative estimates consider that water-related diseases are currently causing between 2 and 5 million deaths every year and this could increase to 59 and 135 million deaths a year by 2020.

(iii) The inter-connected nature of water management within a basin directly impacts on communities, administrative regions and political territories (provinces, nations). Those who share a basin are highly inter-dependent. Basin managers must find ways to address these water-related challenges in order to avert problems, such as social unrest, conflict between states, slowing of economic development and degradation of vital resources. Basins that cover more than one country – transboundary basins – present particular challenges for managers. Historically, transboundary basins have encouraged regional cooperation but, as resources dwindle and demands grow, the potential for conflict over shared waters also grows.

Addressing the Challenges

Many of the challenges water managers are facing is not new. But, because the nature and size of the problems differ from one region to another and from one basin to another, the responses vary widely. There is not and there cannot be a blueprint solution to the problems. However, addressing these challenges usually needs responses in two key areas: responses that address structural issues, including data acquisition, infrastructure and operations and maintenance; and institutional responses (often called 'soft' interventions) that cover issues such as policies and pricing, or knowledge and information. Both kinds of responses are important and inter-related.

The structural interventions, because they provide services, tend to be visible, politically attractive and high cost. They thus draw most attention. The institutional interventions are low cost, sometimes politically or socially contentious and often less tangible. Unfortunately, they thus have a much lower profile. However, it is only by addressing institutional issues that we can ensure that structural interventions are appropriate, sustainable and work as planned, and that they serve those most in need. Devising appropriate institutional responses lies at the heart of the IRBPM approach and enables governments and basin managers to make a significant contribution to managing resources equitably and sustainably through participatory approach to avert the conflicts that are quite obvious.

Integrated Water Resources Management (IWRM)

A central goal of IWRM at the river basin level is to achieve water security for all purposes, as well as manage risks while responding to, and mitigating disasters. The path towards water security requires trade-offs to maintain a proper balance between meeting various sectors' needs, and establishing adaptable governance mechanisms to cope with evolving environmental, economical and social circumstances.

Well-developed, well-tested, scientifically robust, socially acceptable and economically viable approaches to implement IWRM at the river basin level are still not widely available. IWRM strives for effective and reliable delivery of water services by coordinating and balancing the various water-using sectors – this is an important part of sustainable water management.

IWRM is defined by the Global Water Partnership (GWP-2000) as *'A process which promotes the coordinated development and the management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems'*.

Integration

In the context of IRBPM/IWRM, the word 'integration' is of significant importance. Since we all live in and with the hydrological cycle, water is constantly being recharged, used, returned and reused. So we all are interdependent. This interdependence calls for integration. As water is everyone's business, the integration in our management of both 'natural' and 'human' system is required. Integration in the 'natural' system includes integration between land and water use, surface water and ground water, water quality and quantity, upstream and downstream, fresh water and coastal water etc. Integration in the 'human' system includes

mainstreaming water in the national economy, coordination between sectors, partnership between public and private sector management, etc. Thus a 'participatory approach' is inherent in the term 'integration'. Thus IRBPM/IWRM is basically an integrating mechanism which promotes cross-sectoral water management from sub-sectoral water management.

Stakeholders

Stakeholders are the key to the successful implementation of IRBPM/IWRM. However, it is quite a difficult task to properly identify the stakeholders as the stakeholders base constantly vary with the interest and time. Since it is a sensitive issue, managers need to handle the issue carefully.

Basin management requires a clear understanding of stakeholders: who is involved in making decisions on water and land resources management in a basin and who will be affected by those decisions. Once this is understood, ways of getting the right mix of stakeholders involved at appropriate levels of basin management can be organized. The procedures for involving stakeholders need to be designed thoughtfully and implemented carefully. The GWP indicates the following key points to consider when designing stakeholder involvement.

- Ensure all relevant groups of water users are represented.
- Avoid 'capture' of the process by minority or particularly articulate groups.
- Subsidise if necessary to ensure a 'balance' of public and private participation.
- Establish 'rules' to resolve disputes.

In addition to setting up ways to involve stakeholders there is also a need to be specific about the scope of any consultation, what decision processes each group of stakeholders are going to be involved in and how these decisions are to be made. 'Stakeholders' is a very general term and it would be wrong to give the impression that they 'make decisions'. Rather than 'making decisions' they are 'involved in decision-making processes'. Specifying who decides what helps identify any gaps in the basin-wide decision making process. It is important to fill these gaps to ensure that decision making is adequately co-ordinated.

An independent group, such as a *stakeholder advisory group* that advises on key water issues, can make basin management more effective. Stakeholder advisory groups are government-private sector-community groups made up of representatives of basin landowners, relevant state government agencies, local government councils, local water supply authorities and other utilities, economic sectors such as agriculture and energy, and other groups with an interest in land and water management. The role of the advisory group is to advise the basin organization on major basin problems and possible solutions.

Basin Strategic Plan and Basin Management Plan

In the process of implementation of IRBPM/IWRM concept, the initial responsibility of the basin managers is to prepare a 'Basin Strategic Plan' for coming 15-20 years and 'Basin Management Plan' for 3-6 years. Short duration 'Basin Management Plan' is the implementation plan of the long term strategic plan.

There are five main elements in developing a long term ‘Basin Strategic Plan’. They are identifying the issues, setting priorities, identifying management options, analyzing costs and benefits and assessing risks. For each element, it is necessary and good practice to organize dialogue between stakeholders and consult with interested parties and/or the general public. The outcome of the strategic planning process should be a clear statement of the ‘vision' of a basin organisation or basin initiative setting out unambiguous goals and explaining how, when and where the goals will be achieved.

After the ‘Basin Strategic Plan’ is in place, the next task of the manager is to develop (and then implement) the short term ‘Basin Management Plan’. This plan is brokered by decision makers in the basin – government agencies, local authorities, municipalities, private firms, farmers, individuals and community organisations – and signed off' by the basin organisation. The agreed plan will specify responsibilities for action, how costs will be shared, lines of accountability and channels for exchanging and distributing information. It also involves 'adaptive learning' or making sure that, as the plan is implemented, the lessons learned are fed back into the planning process. The plan will most likely contain a mix of infrastructure, maintenance and non-structural tasks such as changes to laws and procedures, regulations, pricing, institutional development, training and other 'soft' interventions – it is not a wish list of projects.

The management plan is the basin organisation's blueprint for water management across the basin. The plan should clearly identify who does what but it is important to understand that the basin organisation itself will not undertake all the tasks in the plan. The role of the basin organisation is to co-ordinate the various tasks carried out by others.

Developing and implementing an appropriate financing system based on ‘polluter-pays’ and ‘user-pays’ principles are a key element of the IWRM. Without a financing strategy, a basin management plan is useless. Financing for basin management covers the following three distinct areas;

- ✓ Stewardship of the resource(institutional and routine tasks & maintenance)
- ✓ Developing and maintaining infrastructure
- ✓ operations of basin organization

Because basin management is a public good it will mainly be funded from public sources. There are only three sources of funds: taxes, tariffs (in the form of charges, tariffs and fees) and transfers (the three Ts). All funds have to come from a combination of these sources. Importantly, funds have to be administered within a clear legal framework and accountability enforced by transparent external audit.

Implementation of IRBPM / IWRM

Implementation of IRBPM/IWRM is a difficult task when considered as a whole. However, implementation may be started at a smaller scale and with corresponding results and experiences, up scaling may be considered. It is a dynamic process and continuous evolution of the system performance helps the stakeholders to appreciate the effort and its future need. The three basic ”pillars” of IRBPM/IWRM are the *enabling environment* of appropriate policies and

laws, the *institutional roles* and framework, and the *management instruments* for these institutions to apply on a daily basis. All this depends on the existence of popular awareness and strong national political will.

Enabling Environment

Within the limits of a basin, it is not an easy task to integrate land uses and water management. This is because land management which covers planning, forestry, industry, agriculture and the environment is usually governed by policies not connected to water policy and is managed by many different parts of an administration. The management of water resources can be a sensitive political issue. Where there is political will, it is possible to put in place policies, laws, financing arrangements and stable public institutions for water management. With political will, the rules and regulations, and institutions that manage water are more likely to function effectively. Thus a strong national political will for the implementation of IRBPM/IWRM is the bare minimum. Right attitude and government as an enabler rather than a top-down manager is the prerequisite for efforts at any scale. Government has to take the following steps;

(i) Formulation of National Water Policy and integration with the policies of different sectors.
(ii) Ministerial coordination and enact water resources legislation
(iii) Ensure separation of regulation and service provision functions
(iv) Encourage and regulate the private sectors
(v) Encourage dialogue with neighbouring countries

Institutional Roles

Appropriate institutions are the backbone for the implementation of IRBPM/IWRM. A key issue is how the basin administration fits with and relates to other administrative levels – national, provincial, district, community. This needs to be resolved in order to avoid duplication and confusion of responsibilities with other administrative bodies. What is needed is a clear legal framework that specifies the roles and responsibilities, rights and obligations of stakeholders, the levels of decentralisation, and the processes and means for good water governance. The concerned institutions or agencies at all levels and across sectors should participate and interact with each other for ensuring the better management. The interaction may be done

(i) By anchoring the coordination at the highest apex level
(ii) By creating coordination bodies at the river basin level
(iii) By developing responsibility to the lowest appropriate level
(iv) By developing human and institutional capacity

Management Instruments

Water managers must use some practical latest technological knowledge and practices to discharge their functions efficiently and effectively. Some of the identified tools in this regard are as below.

(i) Water Resources Assessment

- ✓ Data collection networks and assessment techniques
- ✓ Environmental Impact Assessment (EIA) techniques
- ✓ Risk management tools for instance of floods and droughts

(ii) Communication and Information

- ✓ Raise awareness
- ✓ Informed stakeholders participation

(iii) Allocation and Conflict Resolution

- ✓ Allocation through market instruments
- ✓ Allocation based on the valuation of costs and benefits
- ✓ Tools for conflict resolution: upstream vs downstream, sector vs sector, human vs nature

(iv) Regulatory instruments

- ✓ Direct controls –regulations, rights, standards, land use plans, utility regulations, etc.
- ✓ Economic instruments- prices, tariffs, subsidies, incentives, fees, charges, markets, taxes, etc
- ✓ Encourage self-regulation- transparent benchmarking, product labeling, etc.

(v) Technology

- ✓ Research and development
- ✓ Technology assessment guidelines
- ✓ Technology choice guidelines

(vi) Finance

Experiences

Basin-level water management is not new. Some countries, Spain and France for example, have practiced basin water management for decades. Spain has had nine 'Confederaciones Hidrográficas' (Basin Authorities) for more than 75 years and, since 1964, France has had six 'Comités de Bassin' (Basin Committees) and 'Agences de l'Eau' (Water Agencies). In Germany, the Ruhr Association (Ruhrverband), one of 11 river basin organisations in the state of North Rhine-Westphalia, was created as early as 1899, as a voluntary alliance of water works and hydropower producers. In 1909, the Boundary Waters Treaty between the governments of USA and Canada established an International Joint Commission for shared waters. International commissions were created many years ago in Europe, for instance for the Rhine, Meuse, Scheldt, Moselle and Sarre rivers, and for Lake Geneva. In the US, the Tennessee Valley Authority was established in 1933. The Niger Basin Authority and the Lake Chad Basin

Commission were established in the early 1960s, while the Senegal and Gambia River Development Organisations were created in the 1970s. Mexico in 1992, Brazil in 1997 and Morocco and Algeria modified their water laws and introduced a basin-oriented management approach. In Australia, the 1992 Murray Darling Agreement mandated the Murray–Darling Basin Commission to take responsibility for co-ordination, planning and sustainable management of water, land and the environment. In South East Asia, the Agreement on co-operation for the sustainable development of the Mekong River basin was signed in 1995 and led to the establishment of the Mekong River Commission.

Perhaps, an excellent example of integrated water resources planning in India is in the form of preparation of integrated plan for water resources development of Damodar Valley which is being implemented through Damodar Valley Corporation (1945). The initiative of establishment of Bhakra Beas Management Board (1967) is an excellent example of integrated management where the benefits are shared among various States namely Himachal Pradesh, Punjab, Haryana, Rajasthan and Delhi for various purposes namely domestic, hydropower, irrigation through an integrated operation policy. Although in a very limited manner, Tungbhadra Board (1953) for the operation of Tungbhadra reservoir, a project common to two States namely Andhra Pradesh and Karnataka, in a region which is highly sensitive to water demands, is also a classic example of cooperation through integrated plan and operation. An initiative for a systematic planning for Sone River Basin by adopting integrated approach was taken up with the constitution of Sone River Commission (1980). The constitution of Narmada Control Authority (1980) may also be regarded as a step forward towards integrated management of water resources of river Narmada and to ensure proper implementation of decisions and directives of NWDT Award.

Conclusion

With the acceptance of the finiteness of the resource and increased use with associated quality deterioration, supply side manage which has been in practiced since earlier times is taking a back seat. Further, most of the easy storage sites, which played a key role for resource augmentation, have already been identified and executed and water quality issue has increasing becoming unmanageable in large river systems. Thus, demand side management is now the option which can make this resource utilization sustainable. Therefore, IRBPM/IWRM is increasing being accepted universally for ensuring efficient use of water, with a delicate balance between supply and demand side management to ensure more livelihoods per drop of water. A strong national political backing with appropriate policy and regulation is the need of the hour for managing the resource. Active stakeholder's participation and implementation of the latest technology by the water managers is the key.